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Biological and Clinical Challenges of Tooth Abrasion: Analysis 1,526 Extracted Upper Anterior and Premolar Teeth Used For the Teaching of Oral Biology in University of Benin Dental School

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Abstract: One of the causes of abrasive wear is the use of abrasive tooth pastes and tooth brushes. This may lead to dentin sensitivity if exposed.The aim of this study is to examine 1,526 upper anterior and premolar teeth for evidence of abrasive wear. The segment of teeth were selected because of their preeminence in the smile line.1,526 upper anterior and premolar teeth were examined using key-feature indices of each tooth. Upper central incisors were identified by sharp mesio-incisal angles, upper lateral incisors by rounded disto-incisal angles, upper canines by pointed non-cusp on a bulky crown with prominent cingulium, upper first premolar by double root and bigger buccal cusp and upper second premolar by single rounded root with two equal cusps.Result showed that: Percentage abrasion was more in the canine (10.80%), followed by second premolars (6.028%) and the least the central incisors (0.79%).inConclusion: We conclude that abrasion being inflicted destructive process, preventive health instruction is needed in order to prevent this problem from becoming worse. Strong knowledge of tooth brushes and tooth brushing is recommended for dental practitioners as this will empower them to make evidence based recommendation to their patients and the general public.

Key words: Biology · Clinical challenges · Abrasion

INTRODUCTION

Abrasion is the loss of tooth structure by mechanical forces. It is usually an interaction between teeth and other materials [1]. This is different from, attrition (wear through tooth – tooth contact) [2], erosion (dissolution of hard tissue by acidic substances) [3]. Abfraction is the pathological loss of tooth substance caused by biomechanical loading forces that result in flexure and failure of enamel and dentin at a location away from the loading. There is loss of cervical tooth structure in the absence of caries. This is a non-carious lesion or stress-induced cervical lesion. One of the causes of abrasive wear is the use of abrasive tooth pastes. The mechanism of abrasive damage is through flaking out of chips of single crystals of fluoroapatite that leave severely fractured substrate behind. These teeth are made of small rods of polycrystalline hydroxyapatite, oriented perpendicular to the tooth surface. This rod structure of human teeth presents large scale flexing out of material. Teeth wear for a number of reasons of which abrasion caused by tooth brushes is one. The wear of dental enamel is of interest because the health and appearance of the human oral cavity is affected by the condition of the teeth [5], especially abrasion being a pathological wear of tooth substance through bio-mechanical frictional processes like the over enthusiastic tooth brushing.

MATERIALS AND METHODS

These teeth for study, were collected for the teaching of oral biology to dental students in a tertiary institution. These teeth were preserved in 10% formaline bottle in line with Centre for Disease Control and Prevention guidelines for infection, control of extracted teeth used for research and teaching [6-8]. 1,526 upper anterior and premolar teeth were from the collection of teeth for tooth-morphology in oral biology practical. The upper anterior teeth were sorted into upper central incisors, upper lateral incisors and upper canines. The upper premolars were sorted into

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Fig. 1: *1526 extracted upper anterior teeth and premolar*

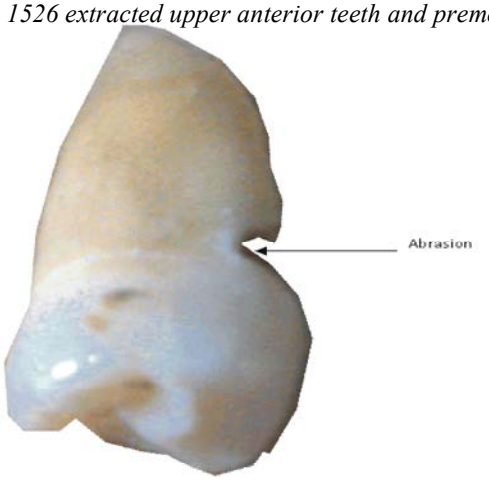

Fig. 2: *Tooth with abrasion*

Table 1: Percentage of 1526 extracted upper anterior teeth and premolar

S/N	Permanent Teeth	Number	% (1526)
1.	Upper central incisors	121	7.93
	(a) Abrasion	12	0.79
	(b) Non-Abrasion	109	7.14
2.	Upper Lateral Incisors	150	9.83
	(a) Abrasion	14	0.92
	(b) Non-Abrasion	136	8.91
3.	Upper canines	854	55.96
	(a) Abrasion	163	10.80
	(b) Non-Abrasion	691	45.28
4.	Upper First Premolars	119	7.798
	(a) Abrasion	50	3.277
	(b) Non-Abrasion	69	4.522
5.	Upper Second Premolars	282	18.48
	(a) Abrasion	92	6.0289
	(b) Non-Abrasion	184	12.058
		337	22.084
		1189	77.916
		1,526	100

Percentage abrasion was more in the canine (10.80%), followed by the second premolars (6.0289%) and the least was the central incisors (0.79%).

upper first premolar, upper second premolar. The indices for sorting were the most dominant-key-feature unique to each tooth. Upper central incisors were identified by sharp mesio-incisal angles, upper lateral incisors by rounded disto-incisal angels, upper canines by pointed mono-cusp on a bulky crown with prominent cingalum, upper first permanent premolar by double root and bigger buccal cusp and upper second premolar single rounded root with two equal cusps. Other teeth of doubtful status were not included to avoid spuriousness. These teeth were selected because of their preeminence before the smile-line and abrasive lesions on them are more visible and of aesthetic concern to the patients.

DISCUSSION

Abrasion is an unsightly aesthetic challenge, which in this study was more the canine (10.80%), followed the premolars (6.0289%) and the incisors (0.79%). Tooth wear of which abrasion is one, appears in recent times to be the most concerning problem of dental practice [9]. It is produced by interaction between teeth and other non-biological materials. There is growing evidence implicating tooth brushing with gingival recession, abrasion and exposure of dentin, therefore, resulting to sensitivity triggered by the neural pathway through hydrodynamic mechanism [10,11]. Dentin sensitivity is a very challenging problem in clinical dentistry with increasing prevalence in the general population [12]. Abrasion is a non-carious cervical lesion. Tooth brush abrasion at the cervical areas of teeth is generally thought to be a result of frequent or forceful tooth brushing [13], outside the normal mode of tooth brushing techniques, which are, horizontal technique (with strokes parallel to the row of teeth and perpendicular to the long axis of teeth), vertical technique (parallel to the long axis of teeth), roll technique (a coronally directed rolling movement from the gingival over the tooth surface) and complex technique (combination of horizontal and vertical strokes) [14]. The etiology of cervical abrasion is multi-factorial and is a combination of several types of wear factors, such as age, diet, gingival recession, periodontal health, dentifrice, spread and pressure used during brushing, which are inter-related. Interest is on-going on the abrasive qualities of tooth paste and as well as types of tooth brushes [15]. This should be the focus especially in the developing countries where tooth brushes are not standardized with clinical consequences of hypersensitivity. We conclude that abrasion being a self-inflicted destructive process, tooth mortality caused by this can be prevented by

effective, oral health instructions and inspiration. This study will enable us combat this problem from its early stages. Oral health literacy and wakefulness are steps in achieving this goal among people [14]. Strong knowledge of toothbrushes and tooth brushing is recommended for dental practitioners as this will empower them to make evidence-based recommendations to their patients and the general public.

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